AN ORTHOPAEDIC OPERATION FOR CLEFT PALATE

BY

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Two years ago I designed for the first time a cleft palate operation that satisfied me theoretically. My experiences with it since may be worth recording. I had never been able to see this problem as other than an orthopaedic one, on the line of reasoning that the object of operating is to give the patient control of the passage between the nose and the mouth, that this control is by voluntary muscles, and that these muscles should be treated on the relevant principles of the branch of surgery concerned with such structures.

The first step along this very unpopular approach to the operation was to find out how the nasopharynx is normally closed. After a good deal of reasoning and experiment I worked out a complicated scheme of muscular action. Very shortly, it was that the passage is closed by the action of two overlapping " slings " of muscle (Fig. 1). The posterior sling is the superior constrictor,

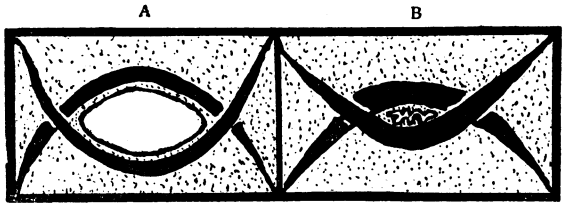

FIG. 1.—Showing how the levator palati and the superior constrictor, acting as two overlapping slings, can close the wide nasopharynx without an abnormal amount of contraction. To close a similar passage by a simple ring sphincter would need a power of shortening far beyond anything shown by voluntary muscle elsewhere.

and its action is helped by the simultaneous contraction of the palatopharyngeus pulling it up into a projecting ruck that is well known as Passavant's ridge. The anterior sling is the levator palati, and it has acting in opposition to it the tensor palati, the only muscle in this region with a nerve supply other than the pharyngeal plexus.

So far as I know, this scheme is the only one that fulfils the following conditions, which seem to be unavoidable.

1. It should correspond with what can be seen on looking through the mouth at a normal palate when the nasopharynx is open or shut. This cuts out all the diagrams in books of voice production.

2. It should correspond with what is seen and felt in a patient gagging under an anaesthetic. I assume throughout that the mechanism is the same whatever the degree or purpose of the closure, whether the tight screwing up of gagging and vomiting, the less tight closure of swallowing, the accurate partial closure of singing, or the light momentary touching of the walls in speech.

3. It should correspond with the behaviour of a catheter lying in the nasopharynx during the act of swallowing and speech. Many anaesthetists must have observed the working out of their endotracheal tubes if the patient is allowed to gag, the reason being that the sphincter rises as it contracts and so thrusts upwards anything it is gripping. I could find no support in the behaviour of such a tube for Wardill's statement that Passavant's ridge remains erect continuously during the time speech lasts, with the soft palate playing upon it.

4. It should close the passage without assuming a quite abnormal variation in length of voluntary muscle. This cuts out Dorrance's account of a simple sphincter, unless the muscle composing it can shorten in contraction to about a quarter of its length in relaxation.

5. It should bring into action all the muscles in this region, which can have no other function than the control of the nasopharynx.

6. There should be some mechanism of opposition to the closure to give the accuracy and rigidity demanded in certain vocal tricks. The nerve supply of the muscles concerned should correspond to this opposition.

Well-known Operations for Cleft Palate

It is hardly necessary to point out that once I had adopted these views, whether they were wright or wrong, obvious objections appeared against all the operations for cleft palate. The classic Langenbeck operation ignored the muscles. Even as performed by such a master as Sir James Berry it gave a large number of failures of union, and at the best only produced a palate the use of which had to be laboriously learnt (probably by an abnormal development of the posterior half of the sphincter). Brophy's operation appeared to me to be a gross mutilation of the whole dental arch for a purpose than could be easily attained in a harmless way. There is never any difficulty in closing a gap in the hard palate if what I would call the " reversed Langenbeck " procedure of sliding the flaps upwards, instead of swinging them downwards, is used. Lane's operation remains a complete puzzle to me. I have never heard of a good functional result from it, and I do not see how one could be attained.

Veau's excellent suggestion of giving the nasal surface of the palate an epithelial lining I have come to think of great importance. But his " suture musculaire " is liable to cut out even when inserted by himself, and it does not control those muscles which I consider the important ones. Gillies's operation was not nearly ambitious enough. I wanted better results than speech with the aid of a plate needing extremely skilled dental assistance to fit. Besides this, most of my patients were young, and the idea of trying to induce a child of 2 years to start on a succession of plates was too much for me.

Wardill's pharyngoplasty, by which he substitutes for the loose and actively rising posterior half of the sphincter a tight mass of scar tissue which drags the sides of the nasopharynx together, appeared to me to go against orthopaedic principles. Apart from my reluctance to destroy the only normal part of the mechanism I was trying to get to work, I had learnt to distrust the permanence of these draggings together and fixations by fibrous tissue. There was also the question of spoiling the drainage of the middle ear by pulling on the Eustachian tube. Dorrance's " push-back " operation was a most reasonable proceeding, but only applicable to a few cases. Like the two preceding techniques, it might be extremely useful where the primary operation had failed to give proper closure.

General Principles of Author's Technique

After a certain number of experiments I adopted a procedure which combined many borrowed points and a few original ones into an operation that was less unsatisfactory than any I had tried before. It turned mainly upon the deliberate freeing of the two separated ends of the sphincter, complete with nerve and blood supply, and their suturing in a plane closer than normal to the posterior wall. I had learnt from watching Mr. O. L. Addison that the wide gaps left in the process of freeing the palate would close with amazing rapidity and very little contracture. The horror with which these are regarded by the plastic surgeon, who knows what penalties would have to be paid if similar chasms were left on the outer surface of the body, is quite unjustified.

The results were satisfactory up to a point. There was one run of twenty successive complete primary healings, and most of the resulting palates moved freely. But I

still had occasional exasperating failures of union, and I still had to warn parents that there would be no automatic improvement in speech after the operation. Something was needed to correspond to that " tension bridge," or modified Logan's bow, by which I had got over two hundred successive primary healings in all varieties of hare-lip. That is to say, a device which would fulfil the two principles of surgery that I was conscious of neglecting ; the first being the removal of all tension from the sutures which actually joined the gap, and the second the leaving of the joined sphincter in the completely shut position. This latter was the really important point. No one would suture a ruptured quadriceps or tendo Achillis without leaving the limb so that the joined muscle lay in the position of contraction during healing. Yet I was leaving my newly constructed ring of muscle much nearer to full extension than full contraction. (The opposing mechanism to the sphincter is so much less important that it can be ignored.) When I saw my present solution to the problem it was simple enough: merely to treat the nasopharynx as one would the mouth of a sack that one wanted to keep shut, and tie a string round it. A ring suture of this sort would be very unlikely to cut out, as the pressure on it would be fairly evenly distributed over its entire length. It took me some time, however, to work out the method ; and, as usually happens with new procedures, the first forms were too complicated.

Points in Technique

LIGHTING

Scialytic operating light plus a 6-volt Winchester parabolic reflector headlight, on a special mounting, with new bulb and batteries for each operating session. Real brilliancy of illumination at the back of the throat is absolutely necessary.

ANAESTHETIC

Intratracheal gas and oxygen for choice ; otherwise oxygen and ether through a weighted tube. The anaesthesia should be too light rather than too deep ; I like to hear the patients talking as they leave the table. Personally I should be terrified of chloroform for this operation.

INSTRUMENTS

I use no special instruments at all, tackling the technical problems that arise in the throat exactly as I would similar ones elsewhere in the body. I have no ambition to change other people's ways of working, but the insertion of the circular suture is beyond the resources of ordinary surgical technique, and for this reason it may be worth describing an individual method. The needle used is spear-pointed to give piercing power without dangerous cutting edges, and curved to the greatest degree that it is possible to sew with, eleven-sixteenths of a circle—the only shape besides a straight one that I have ever been able to see any use for. It is flattened all along its length so that it can be held anywhere by a needle-holder. (Incidentally it is an amusing sidelight on modern surgical methods that all eyeless needles are made round, so that the curved ones swivel in a needle-holder. I have had to have flattened ones specially made.)

The needle-holder is a " pistol-grip " one, the only type I know that fulfils the three requirements of being as firmly held when open as when shut, of having a catch that is safe but can be released by a touch whatever its position, and of pointing along the axis of the forearm so that curved needles can be inserted by simple pronation and supination. A still more important instrument is what I call a " needle-catcher," built like a light toothed artery forceps without a catch. It is held in the " reversed position," pointing down like the ordinary dissecting forceps. (Again it may be noted that there is no term in common use to describe the difference between the way an actor holds a dagger, pointing downwards, and the way in which it is held by those who use it for business purposes, pointing upwards.) Its justification is that it gives a grip by which a needle can be extracted by the point, something quite impossible with dissecting forceps. To insert such stitches as the one needed, the threaded needle is held with its point protruding directly forward in the axis of the holder ; the point is inserted, the catch released, and then the needle is shuffled onwards by alternate grips with the two instruments until it has taken a full bite of tissue and its point returns to view again. This takes some practice, but I do not know any other way in which such a stitch can be inserted except by an automatic device like the " boomerang " needle.

OPERATION

There is first the preliminary one of removing the tonsils and cutting the posterior palatine arteries, as described in my first paper. At least three months afterwards the final stage is performed. The freeing incision

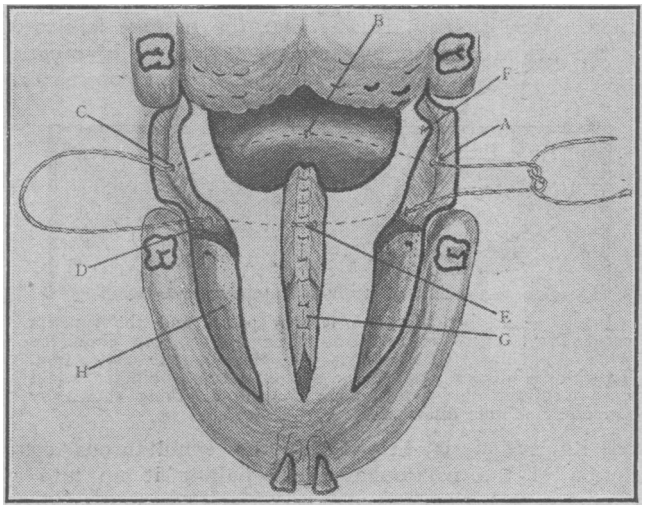

FIG. 2. Insertion of the ring suture.—A, Point of entry of suture, at bottom of right relaxation incision. B, Point of first emergence of needle, and of its reinsertion for the second stitch. C, Point of emergence of suture after crossing the back of the throat. D, Point of insertion of suture into partially sutured soft palate. E, Suture crossing partially sutured cleft ; the nasal mucosa alone has been joined. F, Mucosa of anterior pillar, shrunken up from its original pointed form after being detached from the tongue. G, Mucosa of floor of nose freed and sutured. H, Exposed bone of hard palate. In actual practice it is, of course, impossible to get this view, as the mouth cannot be opened so far. In consequence the surgeon cannot see the line of insertion of the suture across the back of the throat once the gap in the soft palate has been closed.

runs from the canine tooth in front backwards just inside the teeth, then along the line of the pterygomandibular raphe, cuts the anterior pillar of the fauces off the tongue, and ends in the middle of the empty tonsillar fossa. Through this, by forcible blunt dissection controlled by a finger at the point of the instrument, the muco-periosteum of the hard palate, the mucosa of the floor of the nose, and the whole side of the nasopharynx (taking with it the hamular process) are freed so that they fall inwards and backwards towards the posterior wall. It looks, I admit, a severe proceeding, but nothing of any importance is divided, it can be very rapidly done, and the bleeding is not great.

Then from the bottom of the incision that frees the soft palate a double suture of forty-day No. 1 chromic catgut is passed right round the back of the throat in the way described. It enters the tissues opposite the tip of the uvula, emerges in the middle of the posterior wall of the pharynx, is reinserted through the same puncture, and emerges again through the corresponding point to its insertion on the opposite side. Occasionally I cannot get

all the way round in two bites of the needle, and have to take three. The stitch should run behind the superior constrictor exactly in the line of Passavant's ridge, and the test of correct insertion is that the action of this posterior part of the sphincter can be exactly imitated by pulling upon the catgut and rucking up the back of the throat. The tendency of the inexperienced is to insert it too high, in the adenoid bed, which is friable and adherent.

The ends of this suture are left hanging out of either side of the mouth, and the edges of the soft palate are deeply split by a sharp-pointed No. 11 Bard-Parker blade. This split continues backwards the gap between the muco-periosteum of the hard palate and the nasal mucosa, and runs, gradually diminishing in depth, to the tip of the uvula. I think it is a grave mistake to cut loose the soft palate from the palate bone and the nasal mucosa, as is so frequently advised. The continuous nasal surface of soft and hard palate is then joined by interrupted sutures, plain ones for the nasal mucosa and vertical mattress ones for the soft palate. I have lately been using 40-day No. 000 chromic catgut for this, and I think that if carefully tied in a treble knot it is probably better than the ophthalmic silkworm-gut I used before.

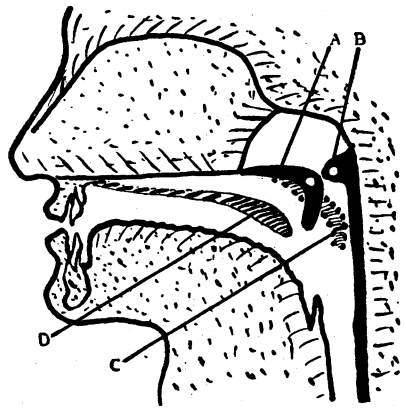

FIG. 3. Closure of the nasopharynx.—A, The soft palate in the position of closure, showing a depression in its centre opposite the level of closure, and the uvula well away from the posterior wall. A white dot shows the position of the ring suture when finally tied. B, Passavant's ridge, with a white dot showing position of the ring suture. C, The position of the soft palate when closing the nasopharynx, as given in text-books. It corresponds to the general notion of its action as that of a flap-valve, rather like a cardiac one. D, The position of the palate after a classic Langenbeck operation. The muco-periosteum of the hard palate has been swung downwards to meet in the mid-line, and the soft palate is shortened by being stretched from side to side.

Then the ring suture is passed through the substance of the soft palate, just in front of the insertion of the tendon of the tensor palati, crossing the half-sutured gap in the middle, and returning to its original insertion in a complete circle round the line of the sphincter. It is left untied (Fig. 2). The oral surface of the soft palate and the mucoperiosteum of the hard palate are then joined by vertical mattress sutures, and any tiny gaps in the epithelial junction carefully closed. The soft palate thus constructed should lie very much closer to the posterior wall of the pharynx than normal, in contrast to that formed by Langenbeck's method, which lies distinctly further away (Fig. 3). The test of its proper construction is to make the patient gag, when the new mechanism should be seen to work properly at the first time of asking, shutting the throat completely.

The ring suture is then tied, the intratracheal catheter being first withdrawn. Its two loops, which are used in case one should break or be injured, are tied separately with several knots, tight enough to close the passage completely. When this is done the soft palate lies closer still to the posterior wall, the uvula often touching it, and the edges of the cleft can be seen to be jammed together quite independently of the stitches that adjust them. The whole area is cleaned and smeared with 1 in 1,000 flavine in paraffin, which may have an antiseptic and waterproofing effect, and the operation is complete.

AFTER-TREATMENT

This is very simple. The ring suture does not cause any obstruction to breathing through the mouth, so there is no necessity for the precautions advised after pharyngoplasty, though the patients snore for the first week or two. I have no qualms about getting them to open their mouths any time after operation, and often make them demonstrate the action of the new sphincter by saying " Ah " while the stitches are still in position. If non-absorbable sutures have been used any remaining ones can be removed a fortnight after operation.

The palates usually stiffen considerably from inflammatory infiltration during the first month, and then slowly become more mobile again, till in six months they are thin and thoroughly supple. Whether speech instruction should be begun immediately after operation is a question upon which I have no strong opinions.

Results of Treatment

I have used this suture for nearly two years on more than seventy cases. All the patients were over 18 months of age, but otherwise they were completely unselected, none being refused on account of size of cleft, weakness of physique, or damage done at previous operation. (Some fourteen had undergone one or more previous attempts.) These cases fall into two divisions. On the first twenty I used the more complicated and difficult technique which I described in a preliminary paper. Two patients developed temporary gaps, which healed in a few months. One other patient died of multiple lung abscesses three weeks after operation ; there was no infection of the wound, and this is my only death in over two hundred cases in which I have used the wide incisions. The remainder all healed by first intention.

In the second division, that in which I used the technique outlined in this paper, the first fifty-two cases all healed completely by first intention. The fifty-third developed a small hole at the junction of hard and soft palates of the type that invariably heals spontaneously (Veau's " trou temporaire "). I have also seen several excellent results produced by my juniors with this method.

But far more important than the percentage of healing are the functional results, and these really seem to me more satisfactory than any I have seen before. At any rate, they are the first in which I have got spontaneous remarks on the improvement in speech from the friends or parents of nearly every patient. The palates also have a distinctive look: they lie close to the back wall of the pharynx, and when the patient says " Ah " they can be seen to go up smartly into a central dimple, just as in the normal throat. This is quite different from the movement of the mobile palates I had previously obtained ; they moved all in one piece. It is too early yet, of course, to dogmatize about results: my younger cases are still in the baby-talk stage, and most of the older ones have to get out of bad habits of speech. And it is not an operation for anyone who is not prepared to study the anatomy and practise the technique before attempting it.

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